

REMARKS

Applicant requests reconsideration and reexamination of the above-identified application. The following remarks state Applicant's bases for making this request and are organized according to the Examiner's Action.

IN THE SPECIFICATION

First, Applicant has carefully reread the Description of the Illustrative Embodiments section of the present application and has made some amendments to the specification to more clearly and concisely describe the present invention based on what is described in the specification and shown in the drawings so that it can be more easily distinguished from the prior art such as U.S. Patent No. 5,541,653 to Peters et al. Applicant believes that no new subject matter is added to the Description.

For example, on page 17, starting at line 23 and continuing to page 18, line 2, "(e.g. axa in FIG. 3) and "(e.g. AxA in FIG. 3)" provide references in the drawings. In the next sentence "by appropriately aligning the camera mount with all the partly filled 1564x1152 sensing elements for four cameras 12-15 and digitally redistributing them evenly over a field overview,..." more concisely discloses the significance of the proper alignment of the CCD cameras.

Further, on page 22, starting at line 17 and ending on page 23, line 3, FIG. 7 is described which is a combined graphic/flow chart and shows "for high resolution, large-format imaging using four bands 81-84 that are optically aligned with a half pixel (one sensing element) offset to each other and a flow chart for high-resolution image reduction." In the last sentence of this paragraph it states that "The digitized images need to be resampled-up for example, from 782x576 to 1564x1152, (See FIGS. 6c and 6d) to take advantage of the fine, sub-pixels-sized sensing elements or finer pixel pitch that permits finer band shifting for better band-to-band registration". These underlined words further clarify but do not add new

matter. The other amendments to the specification serve a similar purpose to facilitate understanding the present invention versus the Peters et al. patent teachings.

CLAIMS REJECTIONS – 35 U.S.C. § 112

The Examiner states that Claims 29 and 38 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for cropping to a resolution of 1520 x 1140 x 4 as described on page 25, lines 5-8, does not reasonably provide enablement for 1532 x 1150 x 4 resolution. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

Applicant has canceled Claims 29 and 38.

CLAIMS REJECTIONS – 35 U.S.C. § 103

The Examiner states that Claims 1-27, 29-38 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over (COMPUTERIZED AIRBORNE MULTICAMERA IMAGING SYSTEM (CAMIS) AND ITS FOUR-CAMERA APPLICATIONS”, authors Xiuhong Sun, James Baker and Richard Hordon, Presented at 3rd International Airborne Remote Sensing Conference and Exhibition, July 7-10, 1997, Copenhagen, Denmark, pp. II-799 TO II-806), herein Sun, in view of USPN 5,541,653 to Peters et al.

The Examiner states that Sun (1997) discloses an imaging system comprising:
means for providing multispectral bands of images (e.g. the four cameras provided with four bands of filters; section 4.1 on pp. II-803);
a computer connected to said multispectral bands of images for receiving said multispectral bands of images (e.g., sections 1 and 2 on pp. II-799 - II-801; Fig. 1);
means for storing said multispectral bands of images (e.g., the storage is inherent in the PC computer).

However, the Examiner further states that Sun (1997) does not disclose nor preclude means within said computer for resampling-up said multispectral bands of images, and means for performing multispectral band-to-band pixel registration of said resampled-up images, but Peters et al. disclose providing four images sensors offset from each other with a spectral band on each sensor and resampling-up said multispectral bands of spectral so that more dense spatial information is gathered by the sensors (e.g., Figs. 18B and 18C; column 23, line 38 – column 24, line 23; column 24, lines 31-34); and Peters et al. further disclose means for performing multispectral band-to-band pixel registration of said resampled-up images such that a representation of each band is present at each location (e.g., column 24, line 37 – column 25, line 32).

Applicant wishes to point out that resampling-up methods have been used in the prior art, such as in Photoshop, before the Applicant's and Peters et al. applications. Peters et al. apply their method for a single chip color mosaic array. Applicant applies resampling-up for multiple monochromatic CCDs. Hence, Applicant and Peters et al. do different things and their implementations are different.

Band-to-band registration is very different for Peters et al. single chip CCD and for Applicant's multispectral imagers. The multispectral imager has different bands of image planes that are generally unregistered by imperfect sensor alignment and lens optical errors, and need dedicated band-to-band registration for multispectral remote sensing. The finer the image pitch (or smaller the pixel size) the more precise the band shift operation using the computer, and the more accurate the band-to-band registration for a color composite. Peters et al. pixel shift has a fixed constant value for all RGB bands of a single chip sensor, but Applicant's band shift distance (in pixels) is variable depending on the original sensor's alignment status for all NIR, R, G, B bands. For example, on page 25, line 20 of the present application, it states "Therefore, the band-to-band pixel registration 94 can be adjusted at a level even less than a half-pixel in each dimension." Hence, the camera offset in the present

invention is never fixed at 0.5A, or 0.5B which is very different from the teachings of Peters et al. Therefore, Applicant has amended Claim 1 to more particularly point out and distinctly claim the subject matter which Applicant regards as his invention. Claim 1 (as amended hereinbefore) calls for:

...four synchronized monochromatic cameras for providing multispectral bands of images,

...a narrow band interference filter in front of each of said four cameras, each filter being one of blue, green, red and NIR,

a computer system...for receiving said multispectral bands and performing resolution enhancement,

means for resampling-up each of said multispectral bands of images using neighbor average interpolation,

means for storing said resampled-up multispectral bands of images for digital processing, and

means for performing fine pitch shifting on said multispectral band-to-band pixel registration of said resampled-up images to obtain more accurate band-to-band registration.

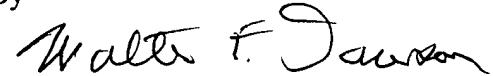
Applicant believes that Claim 1, as amended, is not obvious from Sun 1997 in view of Peters et al., as pointed out above, and that Claim 1, as amended, is now patentable. Applicant is amending Claims 2, 4, 5, 6 and 10 to be more definite and to be dependent on Claim 1 either directly or indirectly, and is canceling Claims 3, and 7-9. Therefore, Applicant believes that Claims 2, 4, 5, 6 and 10, which are dependent on Claim 1, are now patentable. Applicant is canceling Claims 11-40.

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In view of the above, it is submitted that Claims 1, 2, 4, 5, 6 and 10, as amended, are now in condition for allowance. Reconsideration of the rejections to Claims 1, 2, 4, 5, 6 and 10 is respectfully requested. Accordingly, it is requested that these claims be allowed and the case be sent to issue.

If there are any questions, we urge the Examiner to call us. Please charge any costs in connection with this document to our Deposit Account No. 16-0875.

Respectfully Submitted,
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